Candidate Name	Class	Register Number

CHANGKAT CHANGI SECONDARY SCHOOL

Common Test 2 2011 – Marking Scheme

Subject	**:**	**Sci (Phy/Chem), Sci (Phy/Bio)**
Paper No	**:**	**5116/ 5117**
Level	**:**	**Secondary 3 Express**
Date	**:**	**25th August 2011**
Duration	**:**	**1 Hour**
Setter	**:**	**Mr Hong Kam Kheun**

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, class and register number in the spaces at the top of this page.

Section A: MULTIPLE CHOICE QUESTIONS [10 MARKS]
Answer all questions. Select and write your answer on the boxes provided at the end of this section.

Section B : STRUCTURED QUESTIONS [30 MARKS]
Answer all the questions in the spaces provided.

Section C : FREE RESPONSE QUESTIONS [10 MARKS]
Answer the question in this section in the spaces provided.

For Examiners' Use	**Marks**
Science	/ 50
Expected Grade	Actual Grade
Parent's / Guardian's signature	

This Question Paper consists of **12** printed pages.

[Turn over]

Section A: MULTIPLE CHOICE QUESTIONS (10 marks)

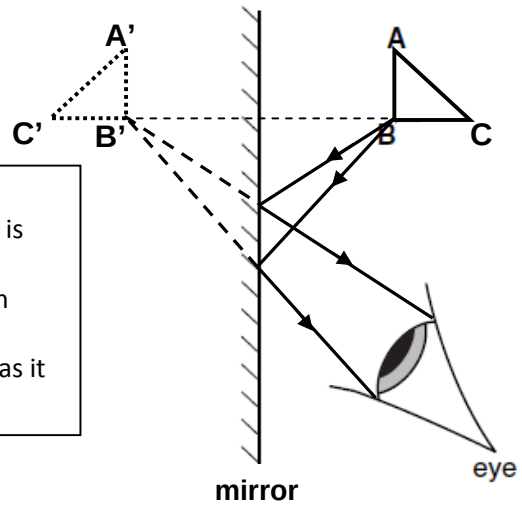
Answer all questions. Select and write your answer in the table provided at the end of this section.

Question	1	2	3	4	5	6	7	8	9	10
Answer	D	C	C	A	D	C	C	C	D	C

Section B: STRUCTURED QUESTIONS (30 marks)

Answer all the questions in the spaces provided.

B1 The diagram shows a triangular object **ABC** placed in front of a plane mirror.



(a)
[1m] – image A'B'C' is equidistant behind mirror as object is in front/.
[1m] – dotted lines as it is a virtual image

(b)
[1m] – for each incident ray, reflected ray and the construction line.
If rays drawn without construction lines, then [1m] for two rays & zero mark for 1 ray drawn.

On the diagram above, draw

(a) the image of the triangle, as seen in the mirror. [2]

(b) the path of two rays of light leaving point **B** and then reflecting at the mirror before reaching the eye. [2]

B2 Fig.B2 shows three students standing 2 m apart in front of a plane mirror which is 3 m long.

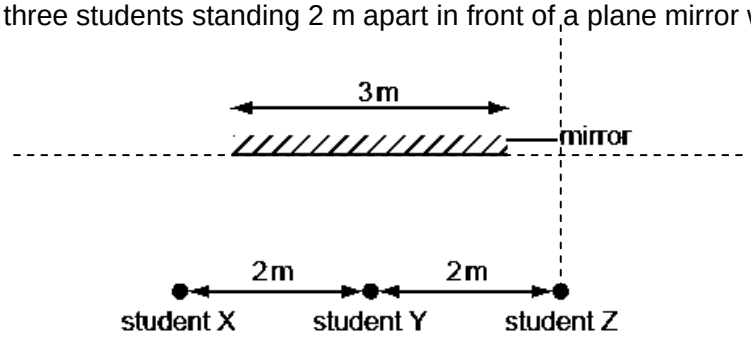


Fig. B2

Student **Y** is standing opposite the mid-point of the mirror.
State how many images can each student see.

(a) Student **X** : **2** images [1m] [1]

(b) Student **Y** : **3** images [1m] [1]

(c) Student **Z** : **2** images [1m] [1]

3 Fig. B3 shows a half metre rule **XY** with a small hole drilled at the 15 cm mark being held vertically. A plane mirror **MN** is placed in front of the ruler and parallel to it. An observer is able to peep through the hole in the half metre rule.

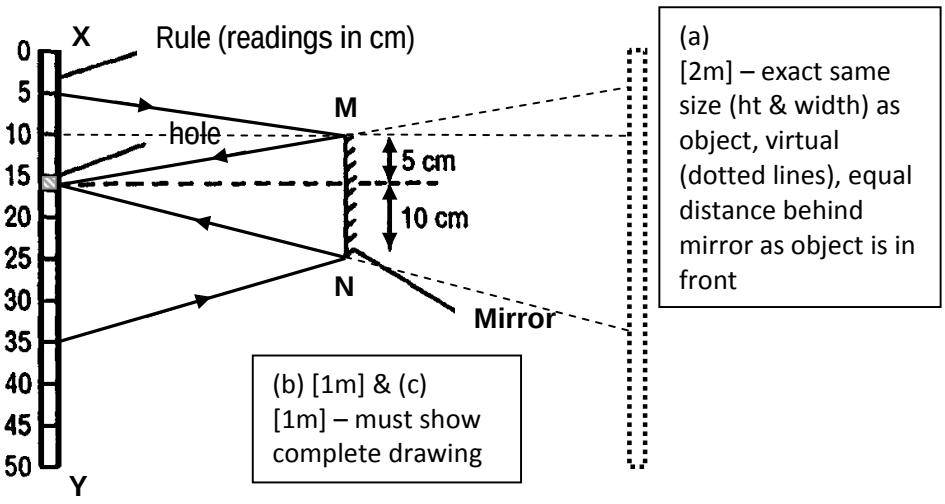


Fig. B3

(a) If the mirror **MN** is long enough for the image of the full length of the half metre rule to be seen by the observer, draw the location of this image of the half metre rule on Fig. B3. [2]

(b) Since the mirror **MN** is 15 cm long, an observer is able to see the image of only a certain length of the half metre rule.

(i) On Fig. B3, draw a ray of light from the highest point of the half metre rule that is reflected by the mirror to the observer's eye. [1]

(ii) On Fig. B3, draw a ray of light from the lowest point of the half metre rule that is reflected by the mirror to the observer's eye. [1]

(iii) State the extent of the half metre rule seen by the observer in terms of the markings on it. [1]

5 cm mark to the **35** cm mark. [1m]

B4 Fig. B4 shows the path of a ray of light as it travels from glass into air.

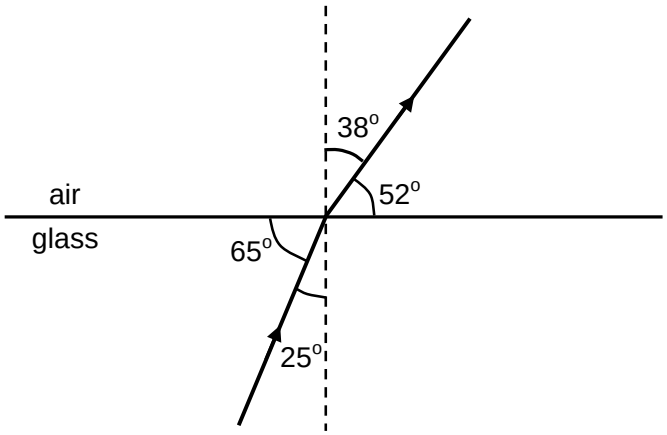


Fig. B4

Showing your working, calculate the refractive index of the glass. [3]

n = sin i_{air} / sin r. [1m]

Reversing the direction of the light ray, i = 38^0 & r = 25^0.

n = sin 38^0 / sin 25^0 [1m]

= 1.46 [1m]

B5 Fig. B5.1 shows a ray of light entering a semi-circular glass block and striking the glass surface at M, the mid-point of the straight face.

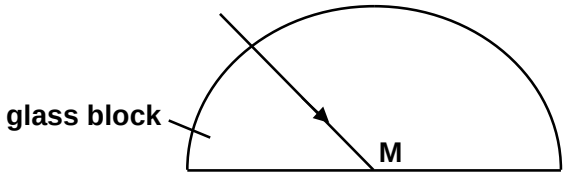


Fig. B5.1

(a) The ray of light strikes the glass surface at **M** with an angle of incidence equal to the critical angle C of light in glass.

(i) State what is the value of the angle of refraction when the angle of incidence is equal to the critical angle C of light in glass. [1]

angle of refraction = $\underline{90^0}$ [1m]

(ii) Given that the angle C is 44^o, calculate the refractive index of the glass. [1]

n = 1 / (sin C) = 1 / sin 44^0 = 1.44 [1m]

(b) Fig. B5.2 shows a second ray of light striking **M**.

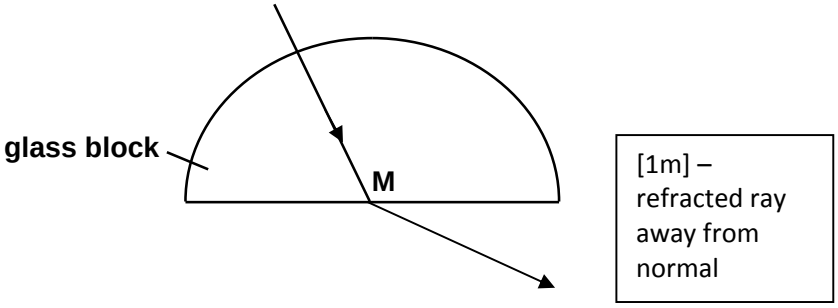


Fig. B5.2

This ray has an angle of incidence at **M** smaller than the critical angle.
On Fig. B5.2, draw the path taken by this ray of light after it strikes the glass surface at **M**. [1]

(c) State two conditions for total internal reflection to occur. [2]

[1m] – angle of incidence > critical angle

[1m] – light ray must travel from an optically denser medium to a less dense medium.

B6 Fig. B6 shows the position of the image **I** formed by light from an object **O** that has passed through a thin converging lens. One ray **R** of light from the top of **O** is shown.

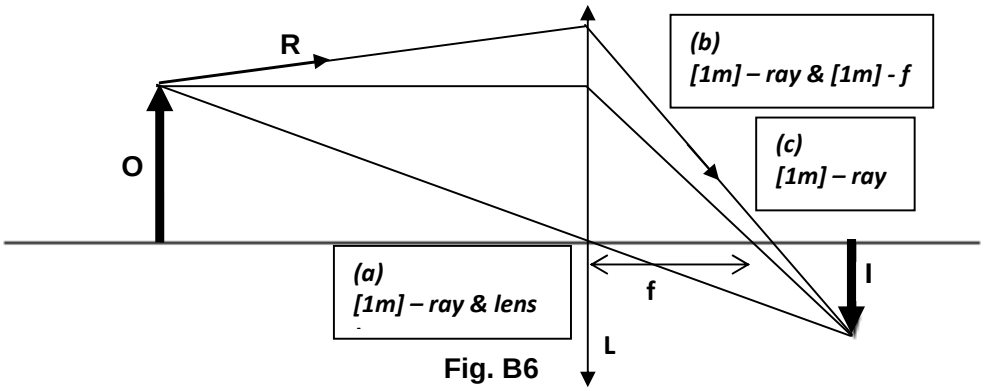


Fig. B6

(a) On Fig. B6, draw the path of a ray of light from the top of **O** that enables the position of the centre of the lens to be found. Label this position **L**. [1]

(b) On Fig. B6, draw the path of a ray of light that enables the focal length of the lens to be found. Mark this distance f and measure the focal length. [3]

focal length of the lens = **2.1 cm [2.0 to 2.2 cm] [1m]**

(c) On Fig. B6, continue the path of the ray **R** of light to show where it would go after passing through the lens. [1]

B7 Fig. B7 shows a long spring fixed at end **B** and stretched so that the other end is at **A**.

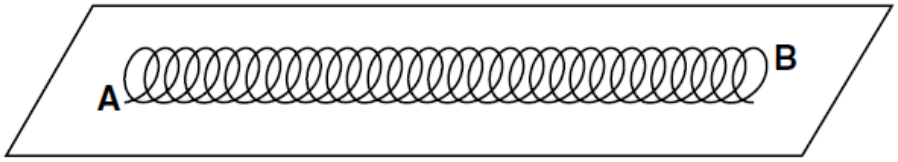


Fig. B7

(a) Describe how end **A** should be moved so that a longitudinal wave travels from **A** towards **B**. [2]

The end A should be move to and fro [1m] in the direction of AB [1m].

(b) A boy moves the spring at a frequency of 2.0 Hz such that the wave produced moves at a speed of 1.2 m/s. [3]
Calculate the wavelength of the wave.

$v = f\lambda$ ➔ $\lambda = v/f$ [1m]; $\lambda = 1.2/2$ [1m] = 0.6 m [1m]

Section C: FREE RESPONSE QUESTIONS (10 marks)

Answer the question in this section in the spaces provided.

C1 Fig. C1 shows a ray of light passing through the edge of a converging lens.

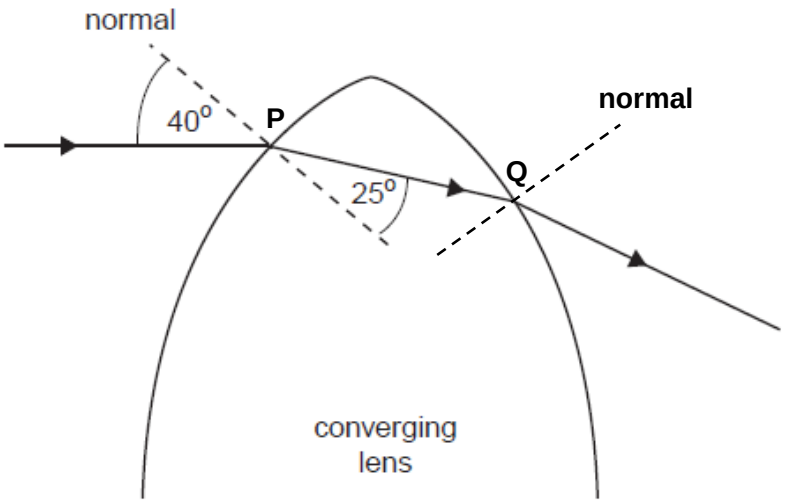


Fig. C1

(a) Calculate the refractive index of the glass used in the lens. [2]

n = sin i / sin r = sin 400 / sin 250 [1m] = 1.52 [1m]

(b) **(i)** Describe what happens to the direction of the ray of light at **P** and **Q** with reference to the normal at the boundaries. [2]

The ray of light at P bends towards the normal as it travels from air into glass [1m] and at Q bends away from the normal as it travels from glass into air. [1m]

D

(ii) Explain why the ray of light travels in the path as shown in Fig. C1. [2]

At P, the speed of light is slower as it enters glass and thus bend towards the normal. At Q, the speed of light is faster as it enters into air and thus bends away from the normal.

(c) The focal length of the lens is 20 cm. An object is placed 50 cm from the lens and an image is formed on a screen.

(i) The image is real. Explain what this means. [1]

A real image can be captured on a screen, [1m]

(ii) State two other properties of the image. [2]

Image is inverted [1m] and diminished [1m].

(iii) State an application for such an image. [1]

Camera or the human eye. [1m]

End of Paper